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Impact of Fertilizer Input Subsidy on Maize Production in Nandi North District, Kenya.

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Abstract

This study addressed the interface between Fertilizer Input Subsidy use and maize productivity. The context is set by confronting the first Millennium Development Goal which targets increased and satisfactory access to food for half of those currently undernourished by the year 2015. Due to the decline of maize production in the country, its' consumption is over and above what is produced. It was therefore important for this study to investigate the effect of fertilizer input subsidies as one of the leading means of raising maize yields and livelihood in Kenya and given that land holdings in the country are not increasing while population growth is on the upward trends on yearly basis. It is well recognized that small scale farming is generally low external input use system in Kenya. It has been established that smallholder farmers are so resource poor such that without external intervention, they will never get to use these inputs; they will remain poor and will not be able to participate in farming as a commercial enterprise.

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This implies that the country will continue to have a high proportion of its people living below absolute poverty levels and food insecure so much that they will have to depend on relief food. Furthermore, it will be practically impossible for the country to meet the first MDG-1 of reducing by half the number of people who are living below absolute poverty and food insecure. This study was guided by the following objectives; to investigate the impact of Farm Input Subsidy program on maize yield In Nandi North District, to assess farm inputs use and adoption based on land holdings by small scale farmers, to investigate the major challenges facing agro-dealer businesses and to establish the efficiency of beneficiary recruitment process. A Survey research design was employed as the data gathering technique. The study sample constituted 100 resource poor farmers who were supported by Farm Input Subsidy by the State Department of Agriculture. Simple random sampling procedure was employed before actual interviews in the field. The study used questionnaire, interview schedule and Focused Group Discussions to collect data from the respondents. Descriptive statistics were applied in data analysis. The study found a positive relationship between maize output and farm input subsidies, application of right quantities of fertilizers and use of certified seeds led to an increase in maize yield. Input use and adoption was also found to be positively related to the size of land owned by smallholder farmers, the study found out that high transaction and transport costs, high supply prices and inadequate supply of inputs are the major challenges facing agro-dealer business in the district. Finally, the study found out that the beneficiary recruitment process was fair and efficient. The study recommended that the government should increase fertilizer use efficiency by promoting use of certified seeds and fertilizers, creating a macro-economic enabling environment for private sector to invest in fertilizer production and by scaling up public private sector partnerships in food security projects in the country. It is hoped that the findings of this study will improve policy makers understanding on the role of Farm Input Subsidy in realizing the MDG -1 in Kenya.

***Keywords*:** Farm Input Subsidy; Maize Production; MDG-1; Kenya.

1. Introduction

1.1. Background Information

Maize is a very important staple food in Kenya grown in almost all agro-ecological zones and on two out of every farm. It account for about 40% of daily calories [1] and has a per capita consumption of 98 Kg, this translates to between 30 and 34 million bags (2.7 – 3.0 metric tonnes) of annual maize consumption in Kenya. Over the years domestic production has stagnated and the quantity imported has increased [1]. Over 85% of the rural population derives their livelihood from agriculture most of whom engage in maize production. Maize is also important in Kenya's crop production patterns, accounting for roughly 20% of gross farm output from small scale farming sector [2] There was tremendous growth in maize production between 1964 and 1997 fuelled by the introduction of hybrid maize and related technologies often dubbed "Kenya's Green Revolution". However, there has been a marked decline in yield since 1997. Maize yield have declined from 1.85 metric tonnes per hectare in the period 1985 – 1989 to the current yield of 1.57 metric tonnes per hectare. Shortage of maize in

Kenya results in food insecurity or famine among the poor urban and rural households. Future increase in maize production will heavily depend on yield improvement rather than expansion in area under production. Kenyan government policy objective for maize sub-sector is to encourage increased production so that self-sufficiency and food security can be achieved. Some of the reasons for the dwindling performance in maize production are associated with the constraints along the maize value chain. Key among the constraints are; poor access to credit, inadequate use of recommended technologies, high cost of inputs, inefficient agricultural extension services among others. There are three ways of realizing the food security, one, by bringing people to food, which would imply massive migration and socio-political unrest, two, by moving the food from surplus to deficit and hunger stricken areas, which is happening through trade and the intervention of World Food Programme (WFP), East African Grain Council (EAGC) and Cereal Growers Associations (CGA). If food imports and aid continue to add to countries' indebtedness and dependence, this is undesirable socio-politically and economically and three, by assisting people in the deficit areas to produce and generate more food and incomes.

1.2. Problem Statement

It is now recognized that for Africa to jumpstart the wheel of economic development, there is need to invest in agriculture which is the major economic activity. This would earn funds that can be invested in other economic activities for increased economic development. It is this realization that prompted the African Union through the New Partnership for Africa's Development (NEPAD) to initiate a move for the governments to commit them to gradually increase budgetary allocation to agricultural development to 10% under Maputo declaration. Increasing fertilizer use is seen as a key input in breaking the low productivity trap. Agricultural sector in Kenya comprises 3.5 million small scale farmers owning land averaging 2.5 acres. This produces 75% of all food and cash crops and livestock in the country. It is well recognized that small scale farming sector is generally low external input system. Less than 30% of the farmers in high potential areas who own about one acre of land use fertilizers and improved seeds in lower potential areas, fertilizers and certified seeds use is less than 20% of the farmers in the same category. The main reason for this phenomenon is that resource poor farmers do not have the know-how and cannot afford the cost of these inputs. The consequence is that soils are depleted of nutrients and farmers obtain low yield. This is the main cause not only of declining agricultural productivity but also of increasing food insecurity and abject poverty [3]. The path to prosperity in Kenya begin at the field of Kenyan farmers who unlike many farmers almost anywhere else in the world, do not produce enough food to nourish their families, communities or the growing population. The facts are well known, our country's population is chronically undernourished, and most of our farmers lack access to productive crop varieties, adequate water resources, soil nutrients, poor road infrastructure, weak and ineffective research and extension farmer linkages. The maize farm input subsidy program is an initiative of the government of Kenya that seek to address the problem of food insecurity and poverty among resource poor farmers by assisting them with agricultural inputs for a given period of time with comprehensive training and capacity building. The primary objective of the subsidy program is to improve access and affordability of key inputs for small-holder resource poor

farmers, particularly those living below the absolute poverty line, so that they can get out of the vicious cycle of poverty and participate in agriculture as a business enterprise. The maize subsidy program was conceptualized due to the observed decline in soil fertility in Kenya due to the limited use of fertilizers especially smallholder farmers. The subsidy program began its operations in 2007/2008 financial year and is currently being implemented countrywide. Achieving food self sufficiency on a national basis is a high priority for the government of Kenya. The goal of farm input subsidy program is to enhance food self sufficiency by increasing smallholder farmers access to and use of improved agricultural inputs, thereby boosting the incomes of resource poor farmers.

1.3. Justification of a Fertilizer subsidy program

There are different justifications put forward for subsidizing fertilizer and they can be grouped as follows [4]: Subsidies are justified on efficiency grounds. They raise fertilizer to optimal levels for farmers who are meeting market failures lack of knowledge and/or high perceived risk versus benefits and/or low affordability. If subsidies can raise fertilizer use to optimal levels including the uptake of fertilizer by smallholders currently applying close to zero fertilizer and if the social benefits of the interventions do not outweigh their cost, then they can be justified. Based on the efficiency argument, it is hoped that subsidies will kick-start innovation at farm level and stimulate rapid market development at industry level. Subsidies may also be justified on equity grounds. They served as an income transfer to poor smallholder households, when well targeted [4]. Subsidies may be adequate finally when they help counteract the negative externalities of decreased soil fertility and increased rural poverty and migration to cities. Fertilizer subsidies relieve the affordability constraint of fertilizer temporarily if there is no rent-seeking behavior by fertilizer dealers but price might not be the only bottleneck preventing widespread input use. Agriculture is one of the core sectors in the Kenyan economy and also one of the economic pillars in the National Vision 2030 and Medium Term Plans. The first medium term plan outlines some of the constraints in the agriculture sector as high cost of farm inputs, limited application of the agriculture technology and innovations, limited extension services, inadequate credit facilities and weak farmers institutions. The Strategy for Revitalizing Agriculture (SRA) in Kenya recognizes that in order to achieve the Millennium Development Goals, one of the most important factors to be considered is the low use of fertilizers and certified seeds. Nationwide the percentage of farmers using fertilizer on maize has increased from 56 percent in 1996 to 70 percent in 2007 while the fertilizer dose rates on maize (maize fields receiving fertilizer) have increased only slightly from 56Kg/acre in 1997 to 59Kg/acre in 2007[3]. Recognizing that the smallholder farmer contribute significantly to the food security and generation of income, the government conceptualized the farm input subsidy programme, which was occasioned by the international fertilizer conference held in June 2006 during which it was observed that soil fertility has continued to decline due to limited use of fertilizers especially by small scale farmers. On average, fertilizer use in Kenya is about 31Kg of nutrients per Ha compared with 8Kg nutrients/Ha in Sub-Saharan Africa, 66Kg/ha in North Africa and over 200Kg nutrients per ha in Asia. As most of the fertilizer use in Kenya is concentrated on export crops and large scale farms, fertilizer use on smallholder farms is less than 10Kg/Ha and resource poor farmers hardly use any. The estimated nutrient removal in Kenya is 68 Kg/Ha (35N, 7P

and 27 K). During the Africa Fertilizer Summit in Abuja, African governments committed themselves to increase fertilizer use in order to enhance food security and eradicate poverty. The 2006 Abuja Declaration committed Africa to achieve 50Kg/Ha of plant nutrient application by 2015. This is a challenging task given that 2015 is only few months away and countries including Malawi, Tanzania, Zambia, Ghana and Nigeria have made appreciable progress. In Africa in particular, increased agricultural production to reduce poverty and improve food security has been stymied by the inability of many farmers to use the inputs and technology that are known to be effective. In more details, the argument runs as follows: Food production per capita in Africa has grown too slowly, well behind rates seen in Asia and Latin America; This has resulted in rising imports of cereals and other staples, and more people who are hungry and undernourished; Yields of staples per hectare have barely risen at all in the region; largely since farmers have not applied manufactured fertilizer in sufficient amounts to take advantage of improved varieties; Farmers have not done so because inputs have been too costly and they have been too poor, with little or no access to credit; Hence in order to resolve the impasse it is necessary to subsidize the costs of inputs thereby creating a virtuous circle of higher yields, higher incomes, more food, less hunger and poverty [5].

1.4 General Objectives

- To investigate the effects of farm input subsidy on maize production

1.4.1 Specific Objectives

- To investigate the impact of farm input subsidy program on maize productivity and household food security
- To assess farm inputs use and adoption based on land sizes
- To establish the efficiency of beneficiary recruitment process
- To investigate challenges facing agro-dealers in Nandi North district
- To document farm input subsidy program success story in Nandi North district

2. Literature Review

2.1 Evolution and Impact of Fertilizer Policies in Kenya

Before the reforms, the government of Kenya provided fertilizer importation monopoly to the Kenya Farmers Association. In mid 1980s the government tried to encourage other firms to enter the market though under very tight controls. For instance the government determined which farms were allowed to operate through licensing requirements and allocation of foreign exchange and fertilizer traders were to adhere to official prices set at 54 market centers throughout the country. By 1993, prices were decontrolled, donor imports dwindled to 5% of total consumption and small scale farmers relied exclusively on private sector and co-operatives for fertilizers. By 1996, there were 12 major importers, 500 wholesalers and roughly 5000 retailers distributing fertilizers in the country. Currently, the private

sector handles nearly 90% of all fertilizer imports. The number of retailers rose to between 7,000 and 8,000 by the year 2000. Some of the largest importers were co-operatives and estate firms supplying their members, most of whom were small scale farmers participating in tea, coffee and sugarcane out growers schemes. Beginning the year 2002, the government through the National Cereals and Produce Board started to engage in fertilizer trade, importing 40,000 tonnes per cropping season. These interventions could discourage private sector [6].

2.2 Consequences of Liberalizing Fertilizer Policies in Kenya.

Fertilizer policies in Kenya were liberalized during the early 1990s. The policy reforms affected the import, wholesale and retail levels. In 1993, price controls on fertilizers were lifted and farmers relied almost exclusively on the private sector and co-operatives for fertilizers. The private sector appeared to have responded very rapidly to the new policy environment. [7] Reported that by 1996, 12 major importers, 500 wholesalers and roughly 5000 retailers were actively distributing fertilizer in Kenya. [8] Estimated that by the year 2000, the number of retailers had risen to between 7000 and 8000. Several more recent studies have revealed that marketing margins on fertilizers have narrowed indicating that the market is generally competitive; particularly at the retail level [9] About 80% of small scale farmers in the high potential maize zones of western Kenya now use fertilizers. Those who use fertilizers on maize apply approximately 100Kg/ha of nutrients which is comparable to mean level in South and East Asia in similar rain fed environment.

2.3 The contribution of Fertilizer Initiative to the Comprehensive Africa Agriculture Development Program (CAADP) Goals

This initiative of the African Union's NEPAD program is integral to achieving the target for agricultural growth as set forth by African governments in the CAADP framework. NEPAD see four dimensions as integral to the development process i.e. human, social, institutional and economic and considers agriculture as the key sector for achieving economic growth. CAADP was thereafter developed as the main avenue for addressing the limitations in the agricultural sector to decrease food insecurity and foster sustainable agricultural development in the continent. After its finalization CAADP was endorsed by the African ministers of agriculture in 2002 and further in Maputo declaration of 2003 where African leaders committed 10% of their national budgets to the agriculture sector. African countries and the regional economic communities have therefore endorsed CAADP and are aligning agricultural sector development policies to the CAADP agenda. The CAADP target of 6% agricultural sector growth rate at the national level by 2015 is envisioned to be achieved through interventions that focus on investment in four pillars. As outlined below, each of these pillars involve the use of modern farm inputs such as fertilizers. Pillar 1: Extending the area under sustainable land management and reliable water control systems. This includes interventions to increase soil quality and nutrient content through increased use of fertilizers. Pillar 2: Improving rural infrastructure and trade related capacities for market access this focus on building rural markets so that farmers can get access to affordable fertilizers and to output markets to sell their produce Pillar 3: Increasing food supply and

reducing hunger to increase yield through use of fertilizers and other modern technologies Pillar 4: Agricultural research technology dissemination and adoption that promotes soil testing, updating of fertilizer recommendations and effective system for technology dissemination and adoption

2.4 African Green Revolution

Components of the Africa's Fertilizer Initiative; the Abuja fertilizer summit, June, 2006

2.4.1 Component 1: Mobilizing African Governments, organizations and civil society and raising awareness worldwide of the potential of fertilizer in improving the conditions of African smallholder farmers. This work was initiated in august 2005; representatives of numerous African countries and organizations have been involved in the effort from the beginning. The countries and regional strategies articulate plans for increased fertilizer use. Visits to African governments and various international organizations have raised the profile of the fertilizer issue and highlighted the importance of the summit.

2.4.2 Component 2: Development of the country and regional Fertilizer strategies. The country and regional fertilizer strategies are being developed my numerous African Countries and all regional economic communities. Their development was initiated in Dec, 2005 and involves a review of current state of fertilizer demand and supply as well as actions required to improve the fertilizer sector.

2.4.3 Component 3: Development of the Africa Fertilizer Action Plan. The main output of the Africa Fertilizer Summit is the Africa Fertilizer Action Plan, which outlines the objectives, elements and actors for the increase of fertilizer use in the continent, including considerations of potential of local manufacturing. The action plan encompasses realistic goals and exit strategies from development and poverty alleviation programs. Special considerations are given to poor farmers who are unable to participate in fertilizer markets. The government officials, farmers, technical experts and donors participate in the development of Fertilizer Action Plans

2.4.4 Component 4: Securing Human and Financial Resources to Implement the Fertilizer Action Plan. The objective of the effort will not be achieved without greater funds for agricultural development those funds will need to come from domestic and regional sources in the continent and from international sources. An important start is the African governments' commitments to increase funding for agriculture at the national level. The summit was a chance for the government and donors to work together to achieve an Action Plan that will be mutually acceptable. Securing of funds for the action plan was initiated immediately after the summit.

2.4.5 Component 5: Implementation of the Fertilizer Action Plan and Strategies. The implementation phase was to be initiated quickly after the summit. The activities funded were to be medium to long term and was to take place at the national level and within the regional economic communities also formed an important component of activities recommended.

2.5 National Economic Blue Print - The Vision 2030

Agriculture is among the priority sectors to be fast tracked in realization of the vision 2030, Kenya is expected to raise income in this sector, with the interventions expected to generate an additional Kshs. 80 – 90 Billion increase in GDP mainly through better yields in key crops, increased small holder specialization in cash crop sector, utilization of a million hectare of currently uncultivated land and near cultivated land of newly opened lands. Vision 2030 recognizes that agriculture will continue to play a crucial role towards the achievement of a sustainable GDP growth rate of 10% annually. Specific strategies as outlined in the vision 2030 involved transforming key institutions in agriculture and livestock to promote household and private sector agriculture growth, increase productivity of crops and livestock and introduce new land use master plan. Vision 2030 has identified four major challenges that continue to face the agriculture sector.

2.5.1 Productivity: Productivity levels for many crops are below potential and for some agricultural produce yield and value over a 5 year period have either remained constant or are on the decline

2.5.2 Land Use: Land in high and medium potential areas as well as in arid and semi arid lands (ASALs) remain under exploited for agricultural production. Much of the available cropland remains underutilized with smallholder using only 60% of their land for agricultural production.

2.5.3 Markets: The productivity of agricultural sector is constrained by inefficiencies in the supply chain resulting from the limited storage capacity, lack of post harvest services and poor access to input markets. Vision 2030 calls for pro-active efforts to maintain existing markets and create new ones to increase Kenya's bargaining power in global agricultural markets.

2.5.4 Value addition: In agriculture value addition determines the competitiveness of the country's produce in world markets. However Kenyan farmers export semi processes, low value produce, which accounts for 91 percent of total agriculture related exports.

2.6 Agriculture and Subsidies in the African Region

In the 1970's and early 80's in a majority of African countries, fertilizer was subsidized and sold through state-owned enterprises in order to address the under provision of fertilizer by the market. However, blamed for being costly, inefficient, overwhelmingly beneficial to large farmers, and detrimental to the private sector, most of the public monopolies of agro-inputs were eliminated during the structural adjustments of the late 80's. Yet in the late 90's, agro-input subsidies have re-emerged under what is now called "smart subsidies". Typically, vouchers are distributed to poor farmers, giving them access to an agro-input package, which will be provided by the private sector at a subsidized price (the providers then trade the vouchers against the amount of the subsidy, at an intermediary bank or agency). This scheme has been claimed to offer the previously-mentioned advantages of traditional fertilizer subsidy while stimulating rather than undermining the private sector, and targeting the poor more effectively. On the other hand, some agencies have indicated failures to target the poor, and the

low cost effectiveness of the intervention [12]. Hence the debate on agro-input subsidy remains very active. The use of voucher subsidy in Mozambique was inspired by neighboring Malawi's agro-input subsidy program. The Starter Pack Scheme (SPS), implemented in 1998, followed by the Target Input Program (TIP) in 2000 and the Farmer Input Subsidy Program (FISP) in 2005, were large scale input subsidies, targeting mostly maize but also tobacco production in Malawi. While these subsidies contributed to a significant increase in fertilizer use and maize Context and Intervention production, helping achieve both national and household food self-sufficiency, their potential for long-term growth and poverty reduction remains unclear. [13] Finds evidence that the households most dependent on maize production were most affected by the 2001-2003 crisis, substantiating worries that the reduction of diversification caused by the subsidy has increased the vulnerability of the beneficiaries. [14] Find that the FISP failed to target the most vulnerable members of the communities (i.e. asset poor households and households with female heads) because the selection of the coupon recipients was affected by political factors. Whether the subsidy programs strengthened or weakened the private provision of agro-inputs remains unknown, and the claim that the subsidized learning of farmers will stimulate commercial demand has not yet been confirmed empirically at this point.

At its peak in 2008/09, subsidy costs accounted for around 16% of Malawi's national budget and 74% of its agricultural budget [15]. Hence the agro-input subsidies brought food self-sufficiency to Malawi at a substantial cost, which threatens its viability. The case for the subsidy depends on whether it can generate long lasting benefits for recipients, which was investigated using a field experiment in Mozambique. Mozambique's economy shares similarities with Malawi, both being low income countries with more than 75% of their population working in small-scale agriculture. Following its independence in 1975, Mozambique went through 15 years of civil war, from 1977 to 1992. Despite an annual GDP growth of 8% on average between 1994 and 2006, it remains one of the poorest countries in the world. In 2011, its Human Development Index was ranked 184th out of 187 countries rated compared to 160th for Malawi. In Mozambique, the agriculture is dominated by small farm farming, with little to no use of tractors, ploughs, fertilizer, pesticides, irrigation and other agro-inputs. The most common crops include maize, cassava, sweet potatoes, cotton, tobacco, sesame and groundnuts. The use of mineral fertilizer among small households is primarily limited to cash crops and scarce on cereal crops, leading to low yield, generally below one ton per hectare for maize production (compared to up to 8 tons per hectare in the most productive developing countries). The nascent input market is small and its network unsubstantial. Between 1996 and 2003, agricultural production grew by an average of 6% per year, leading to a decrease in the rural poverty headcount, from 69% to 54% during the same period. However, [16] note that this growth mainly resulted from the expansion of area cultivated and labor due to the return of migrants, while technological improvements have been modest and yields almost stagnant, which threatens the sustainability of agricultural growth in the absence of future technological progress.

2.7 "Universal" vs. "smart" input subsidy programmes

Many African countries, including Kenya, Tanzania, Malawi, Zimbabwe and Zambia pursued large scale "universal" subsidy programmes from the 1960's up through the 1980's [17]. These programmes were characterized by a government-controlled input and output marketing system, in which farmers were supplied with agricultural inputs at controlled and subsidized prices, and often on heavily subsidized credit. The experiences under these programmes were mixed. The programmes succeeded in raising input use by farmers and increasing agricultural productivity in many cases. However, they were extremely expensive, most subsidies tended to benefit relatively well-off and better connected farmers, and the advances in agricultural productivity were dependent on continued government support. Further, the fertilizer subsidy programmes were prone to inefficiencies arising from high administrative costs, government monopolies and political manipulation [19]. As the subsidy programmes were dismantled and input markets liberalized as a part of the structural adjustment process in the 1980's and 1990's, input use and agricultural productivity declined. After a period of liberalized input markets by the end of the last century, new subsidy programmes began to emerge in several African countries. The Malawian government pioneered the return to large scale subsidies in 1998, when it began distributing free fertilizer to farmers [19]. Other countries, such as Nigeria, Zambia, Tanzania, Kenya, Ghana soon followed Malawi's example. In 2006, Abuja, Nigeria, hosted the Africa Fertilizer Summit under the auspices of the African Union (AU), the New Partnership for African Development (NEPAD) and the Government of Nigeria.

An important output of that summit was the Abuja Declaration on Fertilizer for African Green Revolution, in which AU member states set out to increase fertilizer intensity to an average of 50 kg/ha by 2015. One of the instruments in a five point action plan was to implement smart subsidy programmes to improve access to fertilizers for small-holder farmers. Smart subsidy programmes are meant to address the shortcomings of the universal subsidies. To be "smart", subsidy programmes should adhere to a number of design principles, which can be summarized under the following headlines [20]: Targeting specific farmers. Smart subsidies should be targeted specifically at farmers, who do not already apply agricultural inputs, as well as the poorest and most vulnerable households. This reduces the risks of displacing commercial (non-subsidized) input sales and promotes pro-poor growth; Market-based solutions. Smart subsidy programmes should utilize and support the further development of existing private input supply networks, rather than supplant them with state controlled distribution systems. This enhances the efficiency of input delivery as well as increases the likelihood that the programme has a sustained impact after its termination; Exit strategy. Smart subsidy programmes should devise credible exit strategies to put a time limit on the support. This is primarily to reduce the risks that the programme becomes "hijacked" by political interests [15] and to facilitate long term sustainability. If stakeholders expect the support to continue indefinitely they are less likely to prepare for self sustained use of inputs on market terms. Also, a firm exit strategy helps control the costs of the programme. The three characteristics are largely complementary. If subsidies are well targeted, the greater demand for inputs is likely to encourage potential entrepreneurs to establish new businesses, which promotes the development of a competitive input market. However, if the subsidized inputs primarily displace commercial input sales, private dealers are hurt by the "unfair" state-

supported competition and may choose to exit the market, thereby reducing competition. Similarly, the more efficient is the targeting and input delivery system, the more effective and credible the exit strategy will be.

2.8 Fertilizer Use in the Context of Millennium Development Goals

Millennium Development Goals (MDG1) – Eradication of Extreme Poverty and Hunger implies increased and satisfactory access to food for half of those currently undernourished there are three ways to realize this: bringing people to food, which would imply massive migration and socio-political unrest; move the food from the surplus to deficit and hunger areas which is indeed happening , through trade and through the intervention of World Food Programme (WFP), if food imports and aid continues to add to countries indebtedness and dependence, again this is undesirable socio politically and economically; assist people in deficit areas to produce and generate more food and income, which seems by far the most desirable option. The MDG -1 seem close to being met in Asia and Latin America but not in Africa. There are two main reasons why Sub-Saharan Africa (SSA) is lagging in meeting MDG-1. One, low and declining soil fertility, the major European agricultural soils for example have at least twice as much soil organic carbon as those in SSA. Also European soils are near neutral as opposed to those in SSA which are acidic. Africa is the world most ancient land mass, nutrient impoverished granites; basement sediments and sand cover about 90% of the African land surface. Two extremely low use of fertilizers/mineral fertilizers as compared with other parts of the world. [18]

Recent model projections indicate that mineral fertilizer use in Africa will not surpass 5 million tonnes in 2050. Only under rehabilitation of degraded lands scenario may close to 10 million tonnes be used in 2050[19] Fertilizer can play a major role in realization of MDG-1. Targeting application to soil conditions and plant needs will lead to substantial yield increases at high fertilizer use efficiency or recovery rates. Until 1990, many African governments were heavily involved in the fertilizer sector; this meant a high level of regulation and price control. Fertilizer subsidies were widespread but placed a burden on the limited financial resources of these countries. During 1980s, the World Bank imposed a financial structural adjustment programs in most countries, but the privatization of the fertilizer distribution in countries with a low level of fertilizer consumption on food crops has not proved successful. Demand is low, irregular and dispersed, there is considerable financial and credit risks and the product is bulky. Fertilizer prices for the African farmers are often high and food crop prices low. The quantity of grain required to purchase 1Kg of Nitrogen varies from 6 to 11 compared with about 2 to 3 in Asia. The cost is particularly high in land locked countries.

2.9 Factors Influencing Fertilizer Development in Kenya

Several factors influence the development of the fertilizer sector in Kenya. Some of these include: Growth of the agricultural sector: Demand for fertilizer is what would be referred to as derived demand. This implies that the decision on what types or quantities of fertilizers to use is dependent on

the performance of various crops sub-sectors. For instance demand for specialties hinges highly on the performance of the horticultural sector, while that of say 18:46:0 is influenced by the performance of the maize sub-sector. Research and extension support: The vibrancy of research and extension services is also considered a critical factor in the support of the fertilizer sub sector. Industry players believe that the underperformance of the extension services in the last decade has not only constrained the growth in the use of fertilizers but also contributed in their misuse. Credit support amongst farmers: Agriculture in Kenya is predominantly small scale most of the farmers cannot access fertilizers, amongst other inputs due high cost of credit. Weather: Agriculture in Kenya is predominantly rain-fed. Consequently, most demand for fertilizers is influenced by the weather patterns and yield expectations amongst farmers. Infrastructure: Efficient port and transport is essential for the development of the sub sector. Besides the direct cost, industry players complain of delays in clearing fertilizer consignments at the port of Mombasa. Indeed past studies have reported delays and resultant demurrage charges due to temporarily unavailability of stevedoring crews at the port [2]. Sometimes the berths at the port are inoperable due to non-repair of key equipment [20]. At transportation stage, contrary to expectations, that for bulky commodities like fertilizer, railway transport would be cheaper than road transport, charges from Mombasa to Nairobi are the same on both the railway and by road at about USD 20 (1600) per tonne10. However importers complain of unavailability of wagons and the lengthy haul-time by railway (3-4 days) compared to only 24 hours by road. Financing: Cost-effective fertilizers trade is invariably achieved on high-volumes and therefore requires heavy capital outlay. Stock movement in the chain is season dependent and therefore calls for order-placing that is highly time bound. Moreover, traders involved in the export trade, face cross-country risks emanating particularly from exchange rate volatility and changing political environments. Trade in fertilizers therefore requires strong working capital and risk underwriting support. Currently the fertilizer trade is sufficiently supported by local banks and insurance companies. Moreover the liberalization of the foreign exchange markets has eased the availability of hard currency. However, importers still consider the financing costs, currently estimated at a minimum of 5% of the CIF high. The entry of Africa Trade Insurance Agency (ATIA) under the framework of the common market for Eastern and Central Africa (COMESA) is considered a timely initiative for cross-country trade risk underwriting.

3. Materials and Methods

3.1 Theoretical and Conceptual Framework

The study adopted the Sustainable Livelihoods Approach proposed by U.K Department for International Development 2000 version, which allows appreciation of how capital assets (Human, physical, social, and financial) fit into the Sustainable Livelihoods Framework. The Framework assists with consideration of the various factors that constrain or enhance the livelihood of the household. In the Framework, the understanding of sustainable livelihoods is separated into five parts: the vulnerability context; people's livelihood assets; policies, institutions and processes; livelihood strategies, and livelihood outcomes.

The Framework considers people living and working within a context of vulnerability. Analysis of vulnerability means we have to identify the risks households are under and the resilience they have to cope with negative change in their environment, both short and long-term. Vulnerability includes shocks, trends and seasonality. Shocks could be hurricanes damaging agriculture. Trends may be the gradual decline in the quantity of the products, due to habitat loss, or gradual increase in demand. Vulnerability may be also seasonal: for example, households may have less food at the beginning of the rainy season, making them more vulnerable to illness, and with less time for engaging in farming activities. People's access to assets, and their capacity to utilize them, is shaped by their resilience to negative shocks, trends and seasonality.

Livelihood is sustainable when it can cope with, and recover from, stresses and shocks. For rural development projects, use of the Sustainable Livelihoods Framework can help to identify the ways in which people are most vulnerable, and how they are strongest. This may lead to suggestions of how to make them stronger, for example by helping them to diversify. It may also help to identify ways for government and donors to reduce vulnerability. Analysis of people's access to assets is based on the idea that they require a range of assets to achieve positive Livelihood Outcomes the range of asset capital includes: Natural, Human, physical, social and financial assets.

The Policy, Institutions and Processes part of the Framework includes organizations (large and small), institutions, legislation and the processes which link organizations, institutions and policies to people's lives, these have a profound influence on people's access to assets. They shape people's livelihoods and effectively influence access to various types of capital assets, to livelihood activities, and to decision-making bodies and sources of finance. As noted by [21] the reasons for adoption or non-adoption at farm level vary over space and time. Factors influencing adoption are neither exclusively economic nor purely non-economic. Both economic and non-economic reasons are essential motives for shaping the farmers attitude towards the new technology and its final adoption.

3.2. Procedure

This study was done in Nandi North District, Kenya. The area selected for the study is highly potential and often referred to as one of the Kenya's grain basket. Majority of beneficiaries of farm inputs subsidy are found in this region. When maize production fails in this region, then Kenya faces acute food insecurity. A Survey research design was employed as the data gathering technique. The sample of study constituted resource poor farmers who were supported with Farm Input Subsidy by the government of Kenya through State Department of Agriculture. The sample of resource poor farmers was rural based and made up of smallholder farmers. The study used a sample size of 100 farmers.

3.2.1 Scoping Study

The scoping study was carried out in order to determine the beneficiaries of farm input subsidies in the project area where quantitative data was collected using a semi-structured questionnaire. Mapping of

beneficiaries was carried out for the purpose of eventual random selection in qualitative data collection. The scoping study included conducting a head account which was authenticated or validated by government officials by asking them to confirm the number of farmers issued with farm inputs in the project area.

3.2.2 Focus Group Discussions (FGDs)

This method was applied to collect data from beneficiaries. The information collected during the focus group discussions was particularly important in assessing the reliability of information that was gathered from key informants such as government and secondary sources. We proposed to conduct one focus group discussion comprising 25 farm input subsidy beneficiaries at each of the selected surplus producing areas of the district. The 25 beneficiaries comprised 10 men, 10 women and 5 youths. The researchers liaised with Ministry of Agriculture officials at the local districts and divisions in order to identify one pocket (area) of production where the FGD was conducted. The twenty five (25) farmers who participated in the FGDs were selected using systematic random sampling after establishing household population in the selected study pockets. From each of the identified areas, a group of three to five village elders, including at least one local assistant chief assisted the researchers in listing all resident households in a systematic way. A checklist of questions was used to guide the discussion.

3.2.3 Quantitative methods

Quantitative data was generated through personal interviews using semi-structured questionnaires. This questionnaire targeted randomly selected beneficiaries of farm inputs in identified project area. The questionnaire was pre-tested and revised before administration. Simple random sampling procedure was employed before actual interviews in the field.

4. Results and Discussions

4.1. Descriptive Results

The profiles of households that were slotted into this study are as follows; Males made up 70% of the respondents while females were 30%. In terms of age, 8% of respondents were between 18-27 years, 37% between 28-37 years, 40% between 38-47 years, 9% between 48-57 years, 5.5% between 58-67 years while 0.5% over 67 years. Male headed households comprised of 79 % while female headed households were 21% of the respondents. In marital status, 12% were single, 72.4% married, 1.1% separated while 14.6% were widowed. In terms of educational level, 40 % attended primary school, 30.3% attended secondary school, 26% attended middle-level colleges, 1.6% have bachelor's degree, and 0.5% had masters' degree while 1.6% had no formal education. In terms of full time occupation, 61.1% are farmers, 22.7% are professionals, 14.1% are business people while 2.2% are stay at home mothers.

Before implementation of the programme, majority of respondents; 77.5 percent were harvesting 0-10; 90 Kg Bags/Acre and 22.5 percent reported that they harvested 11 – 20; 90 Kg Bags/Acre of maize. The results of the study in table 2 below indicate that there had been a reported increase in maize yields amongst the beneficiary farmers. The results below shows that maize production increased with 17.2% of respondents harvesting between 0-10; 90Kg bags of maize, 26.5% harvesting 11 – 20 ; 90Kg bags of maize, 38.4% harvesting 21-30; 90Kg bags of maize, 15.2% harvesting 31 – 40 ; 90Kg bags of maize and 2.6% of farmers harvesting 41 – 50; 90Kg bags of maize. Productivity at farm level among the beneficiaries had increased. There was also reported incidences of farmers who harvested >50; 90; Kg bags of maize per acre after the implementation of the subsidy program in the district.

4.2. Impact of Farm Input Subsidy on Production and Household Food Security

Table 1. Maize Yields before Implementation of Farm Input Subsidy Program

	Frequency	Percent	Valid Percent	Cumulative Percent
0-10 : 90 Kg Bags/Acre	117	77.5	77.5	77.5
11 - 20: 90 Kg Bags/Acre	34	22.5	22.5	100.0
Total	151	100.0	100.0	

Source: Survey Results, 2012

Table 2. Maize Yield after Implementation of Farm Input Subsidy Program

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-10 : 90 Kg Bags/Acre	26	17.2	17.2	17.2
	11 - 20: 90Kg Bags/Acre	40	26.5	26.5	43.7
	21-30 :90Kg Bags/Acre	58	38.4	38.4	82.1
	31 – 40 :90Kg Bags/Acre	23	15.2	15.2	97.4
	41 – 50 :90Kg Bags/Acre	4	2.6	2.6	100.0
	Total	151	100.0	100.0	

Source: Survey Results, 2012

The table above show maize yield response to farm inputs after the implementation of farm input subsidy programme in the district. The increased maize production combined with good weather enhanced household food security. The findings of the study show that the overall perception of farm input subsidy program had good results in the lives of farmers and agro-dealers. These impacts arose from increased household food security through provision of inputs to farmers who would not have used such inputs under normal circumstances and by building the capacity of agro-dealers to supply and distribute farm inputs to farmers.

Table 3. Farm Input Use and Adoption Based on Land Size

Land Size	Certified Seeds Use %	Fertilizers Use %	Percentage Total
<5 Acres	2.6	-	2.6
0.5 – 1 Acres	29.8	69.2	30.6
1 – 2 Acres	39.0	15.4	38.6
>2 Acres	28.6	15.4	28.2
Total	100.0	100.0	100.0

Source: Survey Results, 2012

The results indicate that the land resource poor farmers with less than 0.5 acres of land do not use fertilizers when planting seeds and that even those with more than 2 acres do not use the recommended fertilizer quantities in seed planting. The low fertilizer use has resulted in declining soil fertility and increased soil degradation through nutrient mining. However, there are a significant number 69.2% of farmers who own 0.5 – 1 acre who are now using both certified seeds and fertilizers. Food crop yields are very poor due to declining soil fertility as a result of continuous cropping with little or no replenishment of nutrients removed through either crop harvests or other losses such as leaching and soil erosion. Therefore enhanced input use should be sustained so as to enhance household food security. Majority of respondents 94.4 percent reported that they have adopted the use of agricultural inputs after receiving training from the subsidy program. Through the farm input subsidy program, most farmers adopted fertilizer and certified seeds.

4.4. Efficiency of beneficiary Recruitment Process

The programme designed an effective beneficiary selection criterion which has been adopted by all the participating divisions. The criterion enabled the programme to reach the intended targets and has also identified the resource poor farmers through decisive factors that have also been developed by other projects. The programme used Participatory Analysis of poverty and Livelihood dynamics (PAPOLD); the beneficiary recruitment process was conducted through the community committees composed of various stakeholders' i.e. local administration, community leaders, village development committees, Community Based Organizations and Non-governmental Organizations, Faith Based Organizations and Focal Area Development Committees. The farm input beneficiaries were selected by the community in a participatory manner and based on the selection criteria set by the State Department of Agriculture. Selection forums were open, held at specific places which are announced in advance. The criteria used for identification includes: The farmer identified must be resource poor, resident of the village and owning one acre piece of land which are cultivated during the maize planting season. The community identifies the qualifying residents, which includes elderly resource poor headed households, HIV positive resource poor headed households, resource poor child headed households, orphan headed households, resource poor physically challenged headed households and resource poor household heads looking after elderly and physically challenged. The survey sought to establish the community's feeling about the beneficiary selection process. Respondents were asked whether they understood the criteria and its purpose. Table 4 below indicates the findings of the survey. 4.1 percent of the respondents reported that the recruitment process was not fair, 28.7 percent reported that the process was fair, 46.5 percent indicated that the process was good and 20.8 percent of the respondents reported that the recruitment process was very good.

Table 4: Community's Perception on the Beneficiary Selection Process

	Frequency	Percent
Perception of farmers on the Recruitment Process	(f)	%
Not fair	4	4.1
Fair	29	28.7
Good	45	46.5
Very good	21	20.8
Total	100	100

Source: Survey results, 2012.

4.5 Agro-dealer Training and Accreditation

During the farm input implementation period, the government through the agribusiness section encouraged major suppliers to develop an agro-dealer network. The agribusiness directorate developed a training programme for agro-dealers to build their capacity and increase their network in the region. Additionally, the program carried out a geographical mapping exercise to identify the positions of available agro-dealers and also identify areas where additional dealers were needed in order to reduce the distance between farmers and agro-dealers and to ensure that majority of farmers had access to farm input supplier at a reasonable distance. The State Department of Agriculture through the agribusiness directorate encourages the private sector to develop their agro-dealer network. The agribusiness directorate not only supports the subsidy program but also the general agribusiness development i.e. the provision of training in farming business and value chain development.

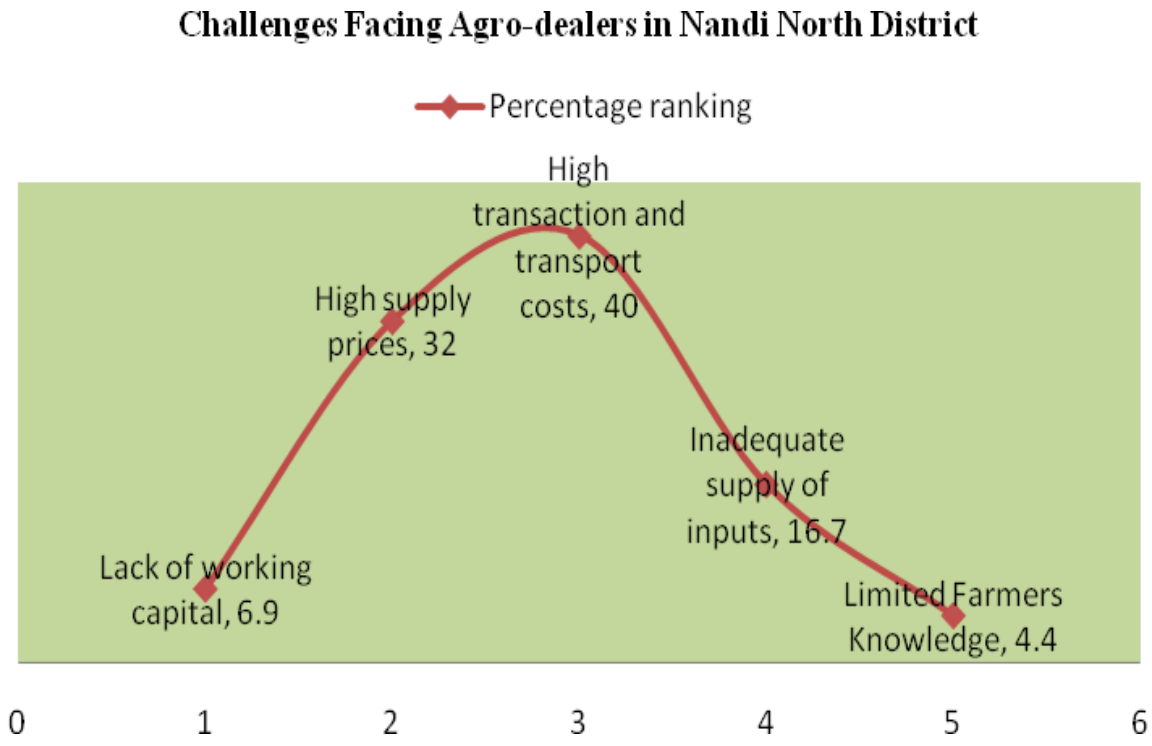

Figure 1: Challenges Facing Agro-dealers in Nandi North District

Figure 1 above show challenges facing agro-dealers in Nandi North district. Most agro-dealers in the district face high transaction and transport cost at 40%, high supply prices at 32%, inadequate supply of inputs at 16.7%, lack of working capital at 6.9% and limited farmers' knowledge at 4.4%. The program partnered with Agricultural Market Development Trust (AGMARK), International Fertilizer Development Corporation (IFDC) and Agro-chemical Association of Kenya (AAK) to train and accredit agro-dealers who participated in the supply of farm inputs. The training covered; technical knowledge on farm inputs, business management, safe use and handling of agro-chemicals, product knowledge on seeds and crop husbandry practices. The training allowed them to not only provides inputs to farmers, but also to share knowledge on improved production practices. The survey

investigated major challenges that agro-dealers face in farm inputs marketing. The following challenges were identified; lack of working capital, high supply prices, high transaction and transportation costs and limited farmer knowledge in delivering inputs to farmers

4.6 Documentation of Farm Input Subsidy Success Story

Documentation of Farm Input Subsidy Success Story in the Study Area

Keretai Farmers Cooperative Project – Nandi North District Kenya

Keretai Farmers Cooperative started in 2008 as a self help group of 28 resource poor farmers who received farm inputs grant of Kshs.7300 per farmer from the State Department of Agriculture to produce maize for household use and some surplus for sale. The farmers were encouraged to pool their surplus produce and source a market for it. From this initial support, the beneficiary farmers managed to pool 84 bags of 90kg and realize a gross income of Kshs. 134,400 in the first year of production. In the second year of production (2009) the group mobilized their resources and borrowed Kshs. 843, 000 from a financial institution and engaged in maize production. They pooled 220 (90Kg) bags of maize in their cereal bank which they sold to Dola millers in Eldoret at a price of Kshs. 2,200 per 90Kg bag. The group repaid their loan fully within 1 year (maize crop cycle). In the third year 2010, the group secured a loan of Kshs. 1,140,000 to increase the scale of production. They collected 640 (90Kg) bags of maize in their cereal bank which was sold to World Food Program (WFP) at a price of Kshs. 1,400 per 50Kg bag. An additional 480 (90 Kg) bags of maize was collected from the group members and sold in the local market to realize a gross income of Kshs.816, 000. That year, the group raised a total of Kshs. 1,712,000 from the sale of maize. The initial group's success attracted new members of the community which grew to their current membership of 140 of whom 105 are females and 35 are males. Due to the large membership, the group converted into a cooperative and put in place plans to expand activities in order to increase their income. The cooperative plans to engage in processing of the surplus maize from members and the surrounding community. It has purchased a 0.2 acre piece of land at a cost of Kshs.100, 000 on which to construct a warehouse and put up a milling and packing plant with a capacity to process 20-22 tons of maize in a day/month. The plant, which will be electrically operated, will consist of a starter maize crusher, a processing mill and an automated packing machine. To finance the maize milling venture, the group will raised Kshs. 1,500,000 from the sale of 500 bags of maize contributed by members, has savings amounting to Kshs.200, 000 and will obtain a loan of Kshs. 1,140,000. The venture will require 222 bags of maize per day. Members will produce the 500 bags of maize using own resources and purchase the balance from the surrounding community. The cooperative will hire a general manager, a financial manager, a clerk/store keeper and a marketing officer. It will also engage the services of a distributor/transporter.

5. Conclusions and Recommendations

The study concluded that farm input subsidy programme led to increased output of maize in the district. The study recommended; strengthening farmers' effective demand for fertilizer by making fertilizer use profitable and by building durable inputs and output markets that can absorb the increased output without gluts that depress producer prices. Increase fertilizer use efficiency by promoting farmers' use of improved crop management practices such as crop rotation with legumes, changes in density and spacing patterns of seeds and placement of fertilizer and seeds at early planting, timely weeding, and applying fertilizer in response to rainfall and other conservation farming methods. Currently the criterion used for selecting beneficiary farmers has worked well. However, there is need for further enhancement to ensure that the farmers selected are capable by not only being identified through stakeholder' forum but by also individually applying for the support. The recruitment of farmers and agro-dealers should start at least two months prior to the onset of the season to allow adequate time to screen the selected beneficiaries. This would also provide adequate time for the agro-dealers to source for the credit facility so as to supply inputs on time.

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